

Selected Congressional Q&As from FY01 and FY02 Crosscutting

Question: What are your views on the technology advancements that have been made in renewable energy? Do you believe that renewable energy can and should play an important role in our nation's energy mix?

Answer: Twenty years ago renewable energy was generally produced at a very high cost and in an inefficient manner. Since then, renewable energy technologies such as wind, solar, biomass, and geothermal -- have made remarkable progress. For example, in the early 1980s the cost of electricity from wind turbines ranged from \$0.30 - \$0.40 per kilowatt-hour (kWh), to more than \$1.00 per kWh from photovoltaic systems, and to at least \$0.16 cents per kWh from geothermal plants. Biomass ethanol for transportation cost more than \$1.00 per gallon. Advancements achieved through research and development conducted by the Department of Energy and its partners have made significant improvements in production costs, system reliability and in reduced energy production costs. Today, the cost of power from wind energy in good wind regions can be as low as \$0.04 - \$0.06 per kWh, electricity from photovoltaics now range from \$0.12 to \$0.20 per kWh, geothermal plants can provide electric power for \$0.05 - \$0.08 per kWh, and research on biomass ethanol is on track for achieving its 2010 production cost goal of \$0.72 per gallon.

While these achievements are truly impressive, substantial work remains to be done. I know that the role of each technology has to be put in perspective with regard to the current energy prices and situations. Clearly, competition and a number of technology advances in the electric power sector has led to dramatic decreases in the price of power from new sources of generation. For example, natural gas-fired combustion turbine technology is capable of providing power at about \$0.03 per kWh today. Still, I believe that the incredible growth and demand for additional power across the Nation suggest that we need to develop a wide-ranging portfolio of domestic-based options to meet the different needs and match the resources of the various regions of our country. For the near term, clean renewable technologies can already provide cost-competitive power in certain applications and can provide competitive peak power and help reduce energy price volatility. In the longer term, renewable energy technologies can meet a substantial portion of our nation's clean energy needs. Therefore, I believe that renewable energy technologies -- including advanced hydropower and renewable/fossil hybrid systems -- can and should play an important role in the U.S. energy future.

Question: The Bush-Cheney campaign literature stated: "George W. Bush understands the promise of renewable energy and believes strongly in encouraging alternative sources such as wind, biomass, and solar." Do these budget cuts for renewable programs represent a reversal of this position?

Answer: No, the budget is not a reversal. The President has repeatedly stated in the campaign and after taking office his personal commitment to renewable energy. He also campaigned on the need for a National Energy Policy. That policy review is underway. In the budget we weeded out some R&D programs that had either accomplished their goals or were not performing as expected. But, in our amended budget, we protect several other programs like Hydrogen, Hydropower and High-Temperature Superconductivity, as launching points for new initiatives.

(dollars in thousands)

FY2001 | FY2002

| \$Change | %Change

Renewable Energy Resources

\$373,179 | \$237,477 | \$39,176 amendment | \$276,653 Total | -\$96,526 | -26%

Note: Of the \$96 million reduction, \$42 million is for congressionally directed projects. The comparable reduction is closer to 16%.

Question: If, as the President states, the country is facing a significant “energy crisis” that is impacting our ability to meet our Nation’s increasing needs for electric power, home heating, and transportation fuel, then why at this critical time does your new Departmental Budget Request reduce funding for research and development of clean, domestic-based renewable energy resource technologies by \$136 million?

Answer: Our ongoing operations will be evaluated against changes to national energy policy that follow from the Vice President’s Energy Policy Development Group. While renewable energy technologies are not capable of replacing fossil fuels in the near-term, renewable energy will be part of the Nation’s long-term energy supply. The Administration’s budget request proposes increasing the performance of existing renewable research and development by winnowing out projects that are less promising and focusing on those next-generation areas that offer the greatest ability to tap or expand these new sources of energy. We need to give the taxpayer a better return on their investment in order to make sure America’s energy needs over the next 20 years are met.

Question: How much has the Department of Energy invested to date in each renewable technology. For that investment, how much power is each technology generating and at what price?

Answer: During the past 20 years, the Department has invested \$4,021,534,000 into renewable technologies. The table below reflects the investment by technology.

Wind Energy - \$594,294,000
Geothermal - \$758,947,000
Solar Energy - \$2,158,735,000
(Concentrating Solar Power, Photovoltaics, and Solar Buildings)
Biomass/Biofuels - \$852,733,000
Hydropower - \$37,531,000

The table below provides most recent data on power generation for the renewable technologies. The hydropower and geothermal data is from the most recent renewable report of the Energy Information Administration (EIA). The other renewable data is from the National Renewable Energy Laboratory (NREL) Database. Since EIA relies upon REPIS , we use the primary data source in such circumstances. Column 2 indicates the amount of electricity in Megawatt-hours. Column 3 shows the range of prices. The costs per kilowatt-hour is extremely site specific for renewables, thus we present ranges based on the DOE program's site data and the methodology in a recent joint DOE/EPRI report .

Technology/Fuel	MWh1	Price (cent/kWh)
Hydropower	319,483,831	3-4
Wind	6,838,056	4-6
Biomass	54,431,136	7-8
Solar Thermal	930,312	12-14
Geothermal	16,812,610	5-8
Photovoltaics	210,240	17-25

Date Prepared: May 22, 2001 Energy Information Administration 2001, Renewable Energy Annual 2000, DOE/EIA-0603(2000) March 2001, Washington D.C.
\REPIS 1999, K. Porter, D. Trickett, L. Bird. The Renewable Electric Plant Information System, NREL. August, 2000. Electric Power Research Institute, Renewable Energy Technology Characterizations, EPRI TR -109496 Dec. 1997.

"Conventional" meaning it excludes about 19,000 MW of pumped hydroelectric a.k.a. pumped storage.

Does not include full capital costs as many of these were built by Federal PMAs. The cost of new hydro would be much higher.

Question: By measures such as cost per kilowatt-hour, the number of installed units in the U.S., the installed generation capacity in the U.S. and the number of vendors in the marketplace, where do the various renewable technologies fall along the path to commercialization?

Answer: All renewable technologies, even photovoltaics, involve some subsystems or components which are mature technologies and some which are relatively immature. Overall, hydroelectric power is the most mature, though research remains on technologies that minimize environmental impacts and on smaller systems. The steam (Rankine-cycle) turbines used to generate most biopower today also are quite mature, but work remains on improving the production of feedstocks expressly for biopower applications, on the handling of these biomass fuels, and on advanced high efficiency gasification, turbine, and fuel cell power generation systems. Of the so-called "new" renewables, wind now has the most installed capacity in the U.S., but, to fully realize the potential of wind power, research is needed on new turbine designs to extract power from winds with lower average speeds. Close behind wind is geothermal, which uses Rankine-cycle turbines to convert heat to electricity, but will benefit from research on improving techniques for extracting heat from the earth. Concentrating solar power which uses Rankine-cycle turbines in large applications will benefit from research in collector technology and heat transfer and collection, and, for distributed systems, from research on innovative heat engines. The "youngest" technology is photovoltaics, which was first demonstrated in the 1950s, and is now at the point where photovoltaic cells can be integrated with building components such as roofing, skylights, and windows, or in stand-alone applications. All of the research on the OPT portfolio focuses on those aspects of renewable technologies that have the greatest potential for cost reductions. The table below provides data, where available, on the measures requested: Cost per kilowatt-hour, installed electric capacity in megawatts (the third part of the question). The table below also shows installed worldwide capacity in MW and the number of vendors for each of the technologies.

Technology/Fuel | Price (cent/kWh) | MW in U.S. (End of 2000) | # Vendors | MW worldwide (End of 2000)

Hydropower	3-4	79,511	N/A	683,000
Biomass	7-8	7,767	N/A	~20,000
Wind	4-6	2,550	N/A	17,300
Geothermal	5-8	2,898	N/A	~9,000
Photovoltaics	17-25	80	50+	1,200
Solar Thermal	12-14	354	N/A	380

Date Prepared: 5/18/01 Data on the number of installed units is not available. For all but PV, NREL and EIA collect installed capacity only. For PVs, which are mass-produced, we also have data on the number of MW (not units) produced in the U.S. and worldwide. In 2000 alone, for example, 287,700 kW of PV modules were produced worldwide, about 75,000 kW in the U.S. The number of vendors involved with each technology is difficult to define because most installed systems are integrated systems of components, incorporating the products of many suppliers. For example, for wind systems, the only truly unique component of the system is the blade. The other components are either adaptations of off-the-shelf products like gearboxes, generators, steel towers, etc. The concept of vendors is somewhat better-defined for PV, where we can cite the numbers of cell or module manufacturers. Because the question is attempting to understand technology maturity, we have provided worldwide installed capacity as an alternate measure of maturity.

"Conventional" meaning it excludes about 19,000 MW of pumped hydroelectric storage. International Energy Annual 1999, DOE/EIA-0219(1999), February 2001, p 99.

OPT program estimate B the wide variety of biomass systems, both in technology and size, make such estimates difficult.

Question: During just the past five years, we've spent \$1.5 billion on renewable energy R&D and another \$5 billion on tax incentives. Yet the proportion of renewable energy in our total energy mix has remained the same, around 5%. Are there specific applications or sectors in which renewables are more likely to contribute?

Answer: The table on the following page indicates typical applications for various renewable energy technologies. While factors such as cost of energy, resource availability and end user needs will help determine the actual penetration and technology mix in these applications, there is the uses described for each technology in the table below are the most probable over the next two decades.

Technology/Fuel | Primary Electric or Energy Application

Hydropower	Hydropower can serve baseload, or constant electricity needs. It can also serve some small-scale, on-site power applications.
Wind	Wind can serve as an energy saver, reducing the need for conventional-fueled power plants. Wind can also serve baseload electricity needs when accompanied with electric storage or other hybrid applications, such as microturbines or fuel cells.
Biomass	Biomass can simultaneously serve heating and cooling energy needs, and electricity generation. Biopower is also useful in on-site applications where bio-resources are plentiful. In addition, bio-resources can be processed as a petroleum-based chemical replacement.
Biofuel	Biofuels can be processed into ethanol to be used as a transportation fuel additive (MTBE replacement) or used as the primary energy source in an ethanol/gasoline blend for specially designed engines.
Solar	Solar energy can be used to heat homes and pools. It can also be used to provide power at peak times, since solar energy production coincides with the peak load power demand curve. Lastly, in combination with electric storage and hybrid applications such as microturbines and fuel cells, solar power can provide on-site baseload power generation.
Geothermal	Geothermal energy can simultaneously serve heating and cooling energy needs, as well as baseload electricity in on-site applications where geothermal resources are available.

Question: Under present law, an income tax credit of 1.5 cents per kiloWatt-hour adjusted for inflation is allowed for the production of electricity from qualified wind facilities, "closed-loop" biomass facilities, and poultry waste farms. The current credit will expire on December 31, 2001. An extension of the credit has been included in a number of legislative proposals, including S. 2557, introduced in the 106th Congress by Senator Murkowski, which you cosponsored. Do you support an extension of the wind energy Production Tax Credit?

Answer: President Bush campaigned on the basis of expanded production of all energy supplies, and clearly supported an extension of this production tax credit. Without an unexpected change of direction as we develop national energy policy, I intend to support an extension. EE-3: Date: January 24, 2001.

Question: Your testimony states, "...the Vice President's National Energy Policy Development Group specifically highlights hydrogen as an important, next-generation technology, and recommends that R&D efforts be focused on integrating current programs regarding hydrogen, fuel cells, and distributed energy."

What is the scope of that you referred to, i.e. within your Office's programs, within the Department of Energy (DOE) across Federal government or between the Federal, state and local governments and the private sector?

Answer: During my testimony, I referred to those program actions primarily within the Office of Energy Efficiency and Renewable Energy (EERE), DOE. These programs are mission-driven, and therefore directed at distinct applications or end-use sectors. EERE's program activities are pursued, however, within the context of the broader portfolio of efforts across DOE, the Federal Government, States and the private sector. Whenever possible, EERE seeks to work either in collaboration or complementary with other organizations in order to achieve better results and to maximize the return for each Federal dollar invested. The development of low-cost hydrogen production processes and high-density hydrogen storage technologies are critical to the successful development and commercialization of fuel cells for transportation and distributed energy systems.

Within that context, EERE has recognized the importance of hydrogen as an interdisciplinary program. In the areas of distributed generation and proton exchange membrane (PEM) fuel cells, the Hydrogen Program supports research, development and engineering validation of reversible fuel cell systems that can co-produce hydrogen and electricity. The Distributed Energy Resources Program has the responsibility for reformat fuel cells to provide combined heat and power. Transportation application PEM fuel cells are also being developed by the Fuel Cells for Transportation Program for vehicles and buses. These programs coordinate their technology development when they are complementary, but conduct independent research when they are not. These first two programs are located within EERE's Office of Power Technologies and the latter within the Office of Transportation Technologies. Collectively, these sector offices have the responsibility to ensure coordination on all research and development of hydrogen and fuel cells applications that include co-sponsored solicitations.

All of the Department's efforts are coordinated via several mechanisms, including joint workshops, Annual Operating Plan reviews and the interagency's Fuel Cell Coordinating Council, which represents the Departments of Energy, Defense, Transportation, Commerce, National Air and Space Administration and the National Science Foundation, and the Interagency Advanced Power Group (IAPG), which includes all of the above agencies except the National Science Foundation.

Question: The Administration's Energy Plan recognizes that our country needs a diverse set of energy resources and I think there's bipartisan consensus in support of that view in the Congress. I think where the consensus may break down is how you go about ensuring our country has a diversity of energy sources. Certainly, we want to try incentives to encourage development of alternative energy sources, but incentives don't guarantee that these alternative energy sources are developed. What do you do besides incentives to guarantee that alternative energy sources are developed for the future? Should we have a portfolio standard to ensure that at least a minimum percentage of the energy mix comes from renewable sources.

Answer: Of the 13 recommendations for renewable and alternative energy contained in the President's National Energy Plan, five are for tax incentives. These five tax incentives are contained in the energy legislation, H.R. 4, which passed the U.S. House of Representatives this summer. Also found among the recommendations in the National Energy Plan are a mix of regulatory and research and development recommendations that will increase America's use of renewable and alternative sources. A key recommendation is for the Secretary of Energy to conduct a review of Research and development programs. We hope to complete that review shortly and submit it

to the Office of Management and Budget (OMB), thus allowing the Administration to work with the Department of Energy (DOE) to prioritize DOE's programs and clarify the linkages of its research and development programs with real world outcomes. Past DOE-sponsored research and development has contributed significantly to greater use of alternative energy. We anticipate that our review will allow an even greater use of alternative energy through focused R&D that leads to accelerated technology results.

On the question of whether we should have a renewable portfolio standard, many states have already chosen to do so. In fact, DOE estimates that existing state laws and policies, if their "guarantees" are maintained, will result in more than a doubling of non-hydro renewables by 2012. The 8,400 MW of additional capacity is from 5,500 MW of state purchase obligations (including renewable portfolio standards) and 2,900 MW estimated to potentially be developed through system-benefits charges and other renewable energy funds. The Secretary of Energy is charged by the National Energy Policy to propose comprehensive electricity legislation that, among other things, promotes renewable energy. A number of options are under consideration to achieve that goal, and no option has been ruled out.

Question: Regarding Coordination with EPA on Emissions Rule-making, and Whether or not DOE should encourage EPA to look at the broader picture of rule-making on emissions instead of single-purpose rule-making on individual emissions.

Answer: Yes. The DOE continues to encourage the Environmental Protection Agency (EPA) to adopt a more integrated approach in its rule-making regarding the control of pollutants. Our encouragement is not limited to ambient air pollutants.

The Office of Energy Efficiency and Renewable Energy is a natural agent for encouraging EPA to adopt a systems approach to problem-solving, since this is a fundamental principle behind our research, development, and deployment programs. When our efficiency programs succeed in saving energy, they simultaneously succeed in reducing a wide spectrum of pollutants and greenhouse gases. So it is natural that our understanding of the value and benefits of using an integrated multi-pollutant approach should stem from our experience. We are committed to approaches and technologies that prevent pollution over a broad range of individual pollutants, including air pollutants, water pollutants and solid waste as well. As you know, we have no authority over EPA, so we are placed in a consultative role to encourage them.

Nonetheless, the DOE Office of Energy Efficiency and Renewable Energy works closely with EPA's Office of Air and Radiation, as well as the commissioners of state environmental programs, to encourage development of State Implementation Plans that use energy efficiency as a strategy of first choice in efforts to achieve clean air goals. Using existing authorities at both the state and national scale, significant multiple benefits may be gained for the economy and the environment. For example, an analysis of federal, state and local refrigerator standards over the period 1975 to 1993 provided annual energy reductions in 1999 equivalent to closing 25 large electric powerplants (1000 MW each), annual emission reductions in 1999 of taking 25 million cars off the road, and all of this at a net annual energy cost savings of \$7 Billion.

In addition to these creative and voluntary efforts, reauthorization of the current 1990 Amendments to the Clean Air Act provides the Congress with a unique opportunity to further encourage and enable EPA to utilize comprehensive approaches in solving pollution problems. It is our view that the integrated approach is highly preferable to an approach that utilizes a series of single-purpose, single-pollutant remedies.

One of our most successful programs to demonstrate the value of an integrated approach was developed and operated jointly with EPA for several years in the early 1990s. This program, National Industrial Competitiveness through Efficiency, Environment and Economics (NICE3)

is a competitive matching grant program that convincingly demonstrates the value of thoughtful design, using a comprehensively integrated approach to solve environmental problems. This program clearly shows the value and multiple benefits of solutions based on good design. While requiring creativity, designs for comprehensive solutions reduce air, water and land pollution of all sorts, with one stroke. Unfortunately, after successfully co-sponsoring this competitive grant program with DOE for a number of years, EPA withdrew their support of the program in the mid-1990s. DOE continues to successfully operate this program within the EERE Office of Industrial Technologies.

Recently, our efforts to encourage comprehensively integrated approaches were strengthened by the National Research Council (NRC) with its recommendation for closer coordination between the Department of Energy and the Environmental Protection Agency -- with regard to the relationship between emission standards and research on emission reductions. This recommendation descends directly from the NRC review of the Partnership for a New Generation of Vehicles (PNGV) program. Since research and development of emission control technologies takes time, a predictable regulatory environment is helpful to the R&D enterprise.

To help ensure coordination with PNGV, EPA and DOE jointly participate as members of the PNGV Steering Group. Each agency is represented on various PNGV technical teams. DOE shares its emission-related research with EPA, and reviews EPA's vehicle and vehicle-fuel-related rule-makings. In the PNGV program, the Federal Government is represented by the Departments of Commerce, Defense, Energy, and Transportation, the Environmental Protection Agency, the National Aeronautics and Space Administration, and the National Science Foundation.

Often offering comments, DOE interacts with (sometimes reacts to) EPA on rule-makings and we usually stress the value of taking an integrated approach:

On March 2, 2000, Mark Mazur of the Department of Energy's Policy Office testified before the House Committee on Commerce, Subcommittee on Health and the Environment on the issue of MTBE in reformulated gasoline. In that testimony, a number of options were offered, short of a ban of MTBE in gasoline, that would nonetheless reduce contamination of water supplies by MTBE. These options were offered based on an understanding of the broader context and opportunities throughout the "life-cycle" of MTBE use.

In a letter from Deputy Secretary of Energy T.J. Glauthier to EPA Administrator Browner dated July 31, 1999, the Department commented in response to EPA's Notice of Proposed Rulemaking on Clean Air Act "Tier 2&" vehicle emission standards and standards for low sulfur gasoline. That letter discusses regulatory uncertainties and their impact on investment decisions. A theme of the comments offered in that letter is that a better understanding of the context in which the refining system operates will provide opportunities for EPA to smooth out potential bumps in implementation.

The DOE recently asked the National Petroleum Council (NPC), a federal advisory committee to the Secretary of Energy, to examine issues related to environmental issues and petroleum product markets. NPC is finishing a study, which addresses the cumulative impacts of several product quality regulations, including changing the role of oxygenates in reformulated gasoline, on refinery viability and product deliverability. A Draft Report, dated March 30, 2000, assesses Government policies and actions that will affect both the petroleum product supply and the continuing viability of U.S. refineries. Secretary of Energy Federico Pena requested this study in a letter to the NPC dated June 30, 1998, as a means of obtaining a clearer picture of the refining landscape and the systems context in which the refiners operate.

Like most individuals, we have found that industry prefers a level of certainty about what may be required of them in the future; and they prefer freedom from sudden shocks to their

operations. Loosely knitted single-purpose rule-making on individual emissions provide neither. A comprehensive design approach provides both.

Question: What has been achieved?

Answer: Throughout the decade of the 1990s, the Office of Energy Efficiency and Renewable Energy (EERE) invested \$712 million in projects described in the success stories document. Additional costs have been incurred by the numerous industrial, university, utility, and public-sector collaborators that have also invested in the commercialization and deployment of these technologies.

More than 5,500 trillion Btu of energy has been saved from equipment implemented to date as a result of these activities. Of this total, 5,050 trillion Btu of savings is from EERE R&D successes, and almost 500 trillion Btu is from EERE field verification, deployment, and outreach successes. These savings are enough to meet the energy needs of all of the citizens, businesses, and industries located in the states of New York, Connecticut, and New Mexico, for one year. EERE R&D and field verification, deployment, and outreach programs have also replaced another 1,700 trillion Btu of fossil fuels with renewable alternatives. This is equivalent to running all of the cars registered in the states of California, Florida, Mississippi, and West Virginia on ethanol rather than gasoline, for one year. Significant reductions in carbon emissions from these activities, 102 million metric tons, have resulted from these reductions in burning fossil fuels.

Question: DOE requests over a billion dollars for the President's Climate Change Technology Initiative -- \$100 million in new spending just for Solar Renewables. The Renewable Indian Energy Resources Program, which is part of the Solar and Renewable Energy Program, has been particularly successful in leveraging electrical infrastructure development by and for Native Americans in my State and in other States. As a result of this program, renewable-fuels generation projects and associated regional electric interties have been constructed where they otherwise would not have been. The benefits are not just rural economic development and better electric rates for individual rural consumers, but also reduced dependence on oil and cleaner air. When it was created about four years ago, the program was authorized and funded at \$10 million annually. In the past several years, funding levels have fallen to \$4 million. Yet, DOE has asked for no funding for the Renewable Indian Energy Resources Program in FY 1999, despite the high cost-effectiveness of this program. I want to urge you to continue to support this small but valuable program. Why? There is no explanation in the budget documents. If no funds are requested because the reauthorization legislation is still pending, please provide for the record citations for all authorities for this program and a list of all currently unauthorized programs for which DOE has requested funding.

Answer: The decision not to seek appropriations for this line item in FY 1999 was not based upon the status of pending reauthorization legislation. Rather, the Department intends to combine the best aspects of two efforts -- the Renewable Indian Energy Resources program and the Federal Buildings/Remote Power Initiative -- into a single, competitive, nation-wide program that is not restricted by either the type of renewable technology or geographic location. The FY 1999 request for Solar Program Support includes \$10M for a new Competitive Solicitation that would provide such flexibility. Additionally, we share your concerns for addressing the needs of our Native Americans for clean, reliable, cost-competitive sources of electricity. It is anticipated that up to \$3M of the proposed \$10M Competitive Solicitation will be reserved for renewable projects that directly benefit Native Americans.

The new initiative, if funded, will be structured as a five-year, cost-shared, highly leveraged partnership (\$10 million per year Federal investment leveraging considerably more non-Federal funds) for identification and deployment of innovative renewable energy and hybrid renewable

technology applications. The Department would offer technical and financial support of new renewable energy projects with up to 70% private sector cost share aimed at projects appropriate for a restructured electric power industry.

Please be assured that DOE will meet its current obligations with regard to ongoing Renewable Indian Energy Resource Program activities. These include:

- **Power Creek Hydroelectric Project** in Cordova, AK The grant is in place. The project received its license from the Federal Energy Regulatory Commission on December 24, 1997. Final design activities are underway.
- **Upper Lynn Canal Regional Electric Project** in Skagway Bay, AK Funding has been provided to the Idaho Operations Office for grants and cooperative agreements for construction of this electrical intertie.
- **Old Harbor Hydroelectric Project** in Village of Old Harbor, AK. Funding has been provided to the Idaho Operations Office for grants and cooperative agreements.
- **Scammon Bay Hydroelectric Feasibility Study Funding** has been provided to the Idaho Operations Office for a study of the potential for locating a hydroelectric facility at this location.

Additionally, pursuant to EPACT Title XXVI, 30 grants for Native American energy projects were awarded during FY 1994 and FY 1995. These 30 Title XXIV grants involved hydroelectric feasibility studies, identification of areas to promote wind farm development, deployment of utility-grade wind turbines, etc., involving 29 tribes within a 13-state area. Twenty-six of the initial 30 grants are currently in close out.

The four remaining Title XXVI grants are:

- **Jicarilla Apache Tribe**

The Jicarilla Apache Tribe is located in Northwestern New Mexico.

There are approximately 3,000 people residing on the Reservation, which is rich in natural gas, hydro, solar and wind resources. In FY 1995, the Tribe obtained an EPACT Title XXVI grant from DOE/EERE to carry out a feasibility study on developing hydroelectricity and other renewable energy resources on the Reservation. The study concluded that it was feasible to obtain 16.5 MW of renewable energy capacity using photovoltaics, wind turbines and a hydroelectric facility.

In FY 1997 the Tribe submitted an unsolicited proposal to EERE's Office of Utility Technologies, seeking technical information and guidance, as well as financial support for development of an implementation plan for its renewable projects. Based on the background and quality of the proposal, as well as the potential for replication of the Jicarilla planning process with other Tribes, \$200,000 was provided in FY 1997 and an additional \$200,000 in FY 1998. Rural applications, such as Native American tribal lands, will have limited choices under utility restructuring. Renewable energy technologies are cost-effective choices for many of these markets.

- **Laguna Pueblo**

The Laguna Pueblo grant was funded in FY 1994. The project's objectives were to produce a feasibility study of manufacturing photovoltaics (PV) modules at the Laguna Industries electrical assembly plant. The grant was given a no-cost extension (which is expected to expire on September 28, 1998) so that the Pueblo could pursue the possibility of manufacturing 5 MW of PV modules for a PV power plant to be constructed by Public Service Co. of New Mexico near Albuquerque.

- Mohegan Tribe

The Mohegan Tribe grant was awarded in FY 1995. The project's objective was to produce an analysis of energy efficiency and renewable energy applications for a proposed tribal destination resort and casino in a former nuclear submarine engine assembly plant. The grant was extended to allow the Tribe to investigate the possibility of incorporating energy efficiency and renewable energy features into their proposed housing project for tribal elders, to be constructed on property adjacent to their casino. This no-cost extension is expected to expire on September 28, 1998.

- Crow Tribe - Montana

The Crow Tribe grant was funded in FY 1994. The Crow Tribe of southeast Montana owns the rights to a large amount of coal, which is currently mined by an outside company under a royalty agreement. The tribe, acting through its wholly owned Crow Energy Corporation, is performing a feasibility study of a 260 MW mine-mouth co-generation plant, the waste heat from which could be used in an industrial plant. The targeted application is a fuel ethanol manufacturing facility, which could provide a market for locally produced grain crops as well as employment for tribal members. The preliminary project report concludes that the power plant could produce electricity in 2002 at a busbar cost of about 3.25 c/kwh, which will be between the current short-term spot market price of 2-2.5 c/kwh and the average local utility rate of 4-5 c/kwh. This

Question: Given that most emissions sources produce more than one undesirable pollutant, does it strike you as sensible that our regulatory regime is centered upon a seemingly endless series of single-purpose rule-makings on individual emissions (Sox, sulfur, particulates)?

Answer: The Department of Energy does encourage the Environmental Protection Agency (EPA) to adopt a more integrated approach in its rule-makings regarding the control of pollutants. DOE also works closely with EPA's Office of Air and Radiation, as well as the commissioners of state environmental programs, on non-regulatory opportunities to approach energy and environmental issues on this broader basis, such as by encouraging development of State Implementation Plans that use energy efficiency as a strategy of choice in efforts to achieve clean air goals.

The Department's efforts to encourage comprehensively integrated approaches were strengthened by the National Research Council (NRC) with its recommendation for closer coordination between the Department of Energy and the Environmental Protection Agency -- with regard to the relationship between emission standards and research on emission reductions. This recommendation descends directly from the NRC report, Review of the Partnership for a New Generation of Vehicles (PNGV) program, 1999.

As an example of this type of coordination with the Environmental Protection Agency on the PNGV program, PNGV, EPA and DOE jointly participate as members of the PNGV Steering Group. Each agency is represented on various PNGV technical teams. DOE shares its emission-related research with EPA, and reviews EPA's vehicle and vehicle-fuel-related rule-makings. In the PNGV program, the Federal Government is represented by the Departments of Commerce, Defense, Energy, and Transportation, the Environmental Protection Agency, the National Aeronautics and Space Administration, and the National Science Foundation. Additionally, the Department provided comments in response to EPA's Notice of Proposed Rulemaking on Clean Air Act "Tier" vehicle emission standards and standards for low sulfur gasoline. That letter discusses regulatory uncertainties and their impact on investment decisions.

To broaden our understanding of energy and environmental interactions, DOE recently asked the National Petroleum Council (NPC), a federal advisory committee to the Secretary of Energy, to examine issues related to environmental issues and petroleum product markets. NPC is finishing a study that addresses the cumulative impacts of several product quality regulations, including changing the role of oxygenates in reformulated gasoline, on refinery viability and product deliverability. A Draft Report, dated March 30, 2000, assesses Government policies and actions

that will affect both the petroleum product supply and the continuing viability of U.S. refineries. Secretary of Energy Federico Pena requested this study in a letter to the NPC dated June 30, 1998, as a means of obtaining a clearer picture of the refining landscape and the systems context in which the refiners operate

Question: For the record, please provide a breakout of funding included in your request for the bio-energy/bio-products initiative, and for each project, include funding information for fiscal year 2001.

Answer: The fiscal year 2001 budget request includes \$26 million in funds for joint activities under the Biobased Products and Bioenergy Initiative. These funds are in four program areas and under two separate appropriation accounts. Under Energy and Water Development, the Department is requesting \$11 million within the Biopower Program and \$7 million within the Biofuels Program. Under the Interior appropriations, the Department is requesting \$5 million within the Agriculture Vision and \$3 million within the Forest and Paper Products Vision. The Department plans to apply these funds to an integrated solicitation supporting the concept of a bio-refinery. This effort is designed to demonstrate whether the combination of biomass technologies in a single facility can improve the economics, and thereby accelerate the commercial introduction of bioproducts and bioenergy.

BioPower

Question: What funds are included for this initiative for programs under the jurisdiction of the Energy and Water Appropriations bill?

Answer: While the Department views all funds appropriated for the Biomass/Biofuels Energy Systems as supporting the Biobased Products and Bioenergy Initiative, specifically \$18 million is requested for joint activities supporting bio-refinery technologies, \$11 million under Power Systems and \$7 million under Transportation.

Question: What other agencies of government are participating in this initiative and what funds are included in each of their budgets?

Answer: Per Executive Order 13134, the Department of Energy (DOE) and the U.S. Department of Agriculture (USDA) have established the Interagency Council on Biobased Products and Bioenergy. This Council is comprised of senior representatives from the following agencies: Commerce, Interior, Treasury, the Environmental Protection Agency, the Office of Management and Budget, the Assistant to the President for Science and Technology, the National Science Foundation, and the Federal Environmental Executive. The two agencies that are leading this interagency effort are DOE and USDA. USDA is currently the only other agency requesting new funding for this Initiative. The USDA fiscal year 2001 request is up \$96 million.

Question: What is the bioenergy/bioproducts initiative and what role do the industry programs play in this initiative?

Answer: The Initiative is a national partnership between the federal government and industry to develop a more comprehensive and coordinated approach toward the development and use of biomass for power, fuels, and chemical products. The Initiative will build on existing Department programs in biofuels for transportation, biopower for utilities, and bioproducts, with the intention to help bring about a much more strongly integrated bioenergy industry. Input from other Federal

agencies, as well as major private sector company leaders, has been obtained to help develop a vision for the bioenergy industry. The Federal government will continue to work with industry on the planning and implementation of programs which support the development of renewable fuels and products for the transportation, utilities and industrial sectors. Within the Office of Energy Efficiency and Renewable Energy, the bioenergy initiative is coordinated across the Office of Transportation Technologies, the Office of Power Technologies, and Office of Industrial Technologies. Within the industry programs, the Agriculture Vision and the Pulp and Paper Products Vision are requesting funds and are actively involved in the planning and implementation of projects designed to integrate biomass-based technologies.

Question: What is the Administration as a whole doing to coordinate its environmental and energy policies?

Answer: Several promote ongoing interagency coordination of environmental and energy policies, including White House task forces (such as the White House Climate Change Task Force) and interagency working groups. In each case, representatives from all of the relevant agencies are included along with White House representatives. Multi-agency budget crosscuts (such as for the Bioenergy and Bioproducts Initiative) are prepared by the Office of Management and Budget (OMB) with each relevant agency to establish the overall funding for multi-agency efforts.

Periodic, but nonetheless important, forms of multi-agency cooperation are also prevalent, including consultation during the rulemaking process (such as the consultation with EPA in the development of the commercial and residential building codes for Federal buildings [10 CFR 434 and 435] and joint sponsorship of studies or conferences exploring particularly complex energy-environmental interactions. Agencies may, of course, formally comment to one another on particular policies or rulemakings of interest and key policy-related documents go through a formal interagency review process. In the case of the budget and rulemakings, OMB reviews agency proposals, providing an additional level of coordination.

Energy and environmental issues interact in complex, and sometimes surprising ways. While these mechanisms provide opportunities to coordinate energy and environmental policies, they will not always work perfectly, especially where important connections between the two are not well understood scientifically or where interactions may be indirect and therefore the need for coordination may not be immediately evident.

Question: How is the Department supporting Biomass Technologies in this budget?

Answer: With the Budget Amendment recently submitted, Biomass technologies within the Energy Efficiency and Renewable Energy program are supported near the FY01 level. In addition, this budget increases Office of Science funding by \$30 million for Biomass basic research.

- Biomass offers promising options for both power and fuels requirements that are environmentally sensitive and can provide an economic stimulus to rural areas.
- In Biopower, which provides 3% of our primary energy, we support R&D to co-fire biomass with fossil fuels such as coal and natural gas; small modular biopower systems; and advanced biomass gasification.
- In Biofuels we support R&D and demonstration in Ethanol Production, Renewable Diesel Alternatives, Feedstock Production, Regional Biomass Energy Program, and Integrated Bioenergy Research.
- In both budgets we have requested \$5 million total for integrated R&D on bioenergy and biobased products to support the biomass R&D Act of 2000.

Dollars in thousands

	FY2001	FY2002	\$Change	%Change
Biomass Technologies	\$86,268	\$80,500		
Budget Amendment		\$1,455 amendment		
Total, Biomass		\$81,955	- \$4,313	- 5.0%

Distributed Energy Resources

Question: I am very interested in your initiative to capitalize on combined heat and power in buildings and industry resulting from distributed generation and utility restructuring. However, I hope the importance of integrating gas cooling technologies in buildings and industrial processes is not lost in the reorganization. What are you doing to provide continuing support and effective integration of these technologies?

Answer: The Distributed Energy Research task force will provide a more cohesive structure to integrate the industrial and buildings combined heating and power (CHP) programs. The buildings cooling heating and power program will still focus on integrating innovative CHP systems, such as incorporation of microturbines with absorption chillers, or fuel cells with desiccant dehumidification systems. It is imperative that coordination occurs among advanced distributed generation systems development, such as the microturbines and advanced reciprocating engine programs, interconnection, buildings codes and standards building technologies, such as fuel cells, absorption chillers.

Geothermal

Question: I would like you to provide your views on the effort to develop a geothermal energy project on Federal lands in the Glass Mountain area near the southern Oregon border. The entire process has literally dragged on for decades. It involved getting the Bonneville Power Administration to make a commitment to buy energy in the project and the Forest Service and BLM were also involved in a whole series of environmental reviews. Getting each of these agencies on board has involved years of reviews and delays on decisions about the project. Last year, then Energy Secretary Richardson called it "an important test of the future viability of geothermal energy in the West." If that's the case, then I think you would have to give a grade of "needs improvement" on that test. What can this Administration do to promote the development of geothermal and other renewable energy sources on Federal land in an environmentally responsible way?

Answer: The Department of Energy supports increasing the use of geothermal energy in the West and has specifically gone on record in support of both the Fourmile Hill and the Telephone Flat projects in the Medicine Lake Highlands near Glass Mountain. While the Department was a participating Federal agency in the process of preparing an Environmental Impact Statements for both of those projects, we did not have the authority or responsibility for issuing either Record of Decision. That responsibility lay jointly with the U.S. Bureau of Land Management and the U.S. Forest Service. Both projects underwent considerable scrutiny during the review process, which was instrumental in helping those agencies formulate mitigation plans to minimize potential impacts from the projects. In the case of Telephone Flat, the impacts were judged to be unacceptable, even with mitigation, and the project was denied. However, the Fourmile Hill project was authorized to proceed under rather stringent conditions.

In May of this year, the National Energy Policy Development (NEPD) Group issued its recommendations for reliable, affordable, and environmentally sound energy for America's future. An entire chapter was devoted to increasing use of renewable and alternative energy. It including the following two recommendations relevant to leasing of Federal land for geothermal development:

- the NEPD Group recommends that the President direct the Secretaries of the Interior and Energy to re-evaluate access limitations to Federal lands in order to increase renewable energy production, such as biomass, wind, geothermal, and solar; and

- the NEPD Group recommends that the President direct the Secretary of the Interior to determine ways to reduce the delays in geothermal lease processing as part of the permitting review process;

The Department of Energy is working closely with the Departments of the Interior and Agriculture to implement these recommendations and help increase the use of renewables, specifically including geothermal energy, on public lands.

Question: The Department has an opportunity to help fund much needed baseload energy in California. Can the Department contribute to recharging The Geysers by assisting in supplying reclaimed water from Santa Rosa?

Answer: In the past, the Department supported a feasibility study of the geothermal pipeline alternative that led to the selection of this wastewater disposal option by the City of Santa Rosa. The Department has also worked closely with the geothermal industry in a research program to understand the drop in reservoir pressure and productivity at The Geysers. This research figured prominently in the subsequent success of the Lake County pipeline project. At this stage, we view the Santa Rosa Geysers Recharge Project as a public works water project rather than a research and development effort. We believe the City of Santa Rosa and the geothermal industry are fully capable of successfully developing the project without further assistance from the Department of Energy.

Question: The hearing acknowledged the need to develop water injection for geothermal resources that lack water to transfer their full heat potential. This technology is currently needed to address different heat and corrosion reservoir conditions within The Geysers and will eventually be needed at other reservoirs. Besides funding for the Lake County project and a small amount of initial funding for the Santa Rosa project, what research and development has the Department funded on water injection? Why has the Enhanced geothermal Systems activity been eliminated from the proposed 2002 budget?

Answer: The Department considers injection as an essential element of a successful geothermal project. The injection of water, including the used brines from geothermal reservoirs, helps maintain the productivity of the reservoir and prolong its lifetime. We have conducted broad-ranging research related to injection, which included improvements to reservoir simulators and the use of tracers that can be used to locate injection wells for proper reservoir management. In particular, we worked with the developer of the Dixie Valley (NV) geothermal resource to gain a much improved understanding of how fluids move through the reservoir from injection wells to production wells. The developer has used that information to implement an injection program that includes augmenting used brines with water from a shallow aquifer. Our work on injection has already improved the productivity of the geothermal fields at The Geysers and Dixie Valley and promises to have positive impacts at many other fields as well. In concluding our efforts in Enhanced Geothermal Systems, the Department is placing higher priority on other activities within the Geothermal Program that have been identified by industry as critical for overcoming the chief technical barriers to greater near-term use of geothermal energy. These activities include developing technologies for finding and characterizing geothermal resources and reducing the cost of drilling wells.

Hydrogen

Question: What is the focus of the Department's Hydrogen Research program?

Answer: The amended budget maintains level funding for hydrogen research because it has significant long-term potential in both the transportation and utility sectors. The use of hydrogen fuel produced from biomass, waste, and other renewable feedstocks will result in emissions of only steam.

We will work on developing suitable production, storage and use technologies, including the infrastructure that would support this new fuel in wide usage. The key cost drivers right now are production (still 2-3 times the cost of natural gas), and storage. The program plans to validate several reversible fuel cell systems by 2005, which reduce the capital cost and resultant electrical generation cost.

By 2010, we believe we be able to have hydrogen refueling stations with a hydrogen cost competitive with today's gasoline fuel prices on a cost-per-mile basis when used in a hydrogen fuel cell vehicle.

Dollars in thousands

	FY2001	FY2002	\$Change	%Change
Hydrogen Research	\$26,881	\$13,900		
		\$12,981 amendment		
		\$26,881	0	0

Definition: "Reversible" Fuel Cell – Like a "rechargeable" battery, a "reversible" fuel cell can be used to produce electricity from the fuels it is fed, or be reversed to produce the fuels when it is fed with electricity.

Question: Why are advanced hydrogen production and storage technologies important?

Answer: Hydrogen can be used both in stationary applications that have benefits for the power sector and in mobile applications where it can displace petroleum. Fuel cells, because of their modularity and low or zero emissions, offer significant opportunities for distributed generation, which can place new generating sources near load centers. This placement means that the new generating capacity does not add to the load on major transmission lines and switching or distribution centers, many of which are already operating at or near their maximum capacity. Economical technologies for producing pure hydrogen will allow fuel cells to operate more efficiently than they do on the hydrogen-rich (but not pure) gas that current-generation reformers provide, thus boosting their output while lowering their emissions of regulated pollutants to essentially zero.

If the hydrogen is produced from renewable fuel sources rather than natural gas or coal, then the fuel-cell systems become net-zero greenhouse gas power systems as well. If "reversible" fuel cells and bulk hydrogen storage can be produced economically, they can provide significant benefits to utilities for load-leveling, by running "in reverse" to generate hydrogen from water and electricity when electric demand is low, and then generating electricity from the stored hydrogen when electric demand is high.

(dollars in thousands)

	FY2001	FY2002	\$Change	%Change
Hydrogen	\$26,881	\$13,900		
		\$12,981 amendment		
		\$26,881	0	0%

Question: How does the U.S. Federally funded hydrogen R&D programs compare with other countries that are committed to a hydrogen-based energy future?

Answer: The U.S. Federally funded R&D program is the largest national effort at \$31,000,000 for FY 2002. The Hydrogen Program includes research and development activities for production, storage and utilization and technology validation efforts that include hydrogen/renewable systems, hydrogen refueling stations and power park projects.

Many of the larger-scale hydrogen demonstration projects taking place in Europe are part of the European Union Framework Programmes. Hydrogen is integral in several key action areas, particularly fuel cells. During 1998-2002, \$25 million (of which \$11 million is for transport projects and \$14 million is for stationary electricity generation) is being provided by the EU and an additional \$65 million is provided by industry. A total of \$45 million is being provided for 30 fuel cell buses that will be demonstrated in 10 European cities.

Of the national programs, Japan's is the next largest in scope and funding to the U.S. program. The program is centered around a fully integrated hydrogen society. The portfolio of technologies under development mirror the range of technology currently planned for the U.S. DOE Hydrogen Program: FY99 funding was approximately \$13 million. Total funding for Phase II (1998 - 2003) is planned for \$81 million. Japanese industry also supports a number of large hydrogen research efforts, particularly in the automotive arena.

Canada combines Hydrogen and Fuel Cells into a single program that is approximately \$4 million per year. The program is geared toward technologies with short-to-medium term commercial potential. Several Canadian companies, such as Ballard and Stuart Energy are world leaders in hydrogen technologies and have received a great deal of external funding from other governments and industry. For example, Ford contributed \$400 million to Ballard's Fuel Cell development program.

Germany has a unique position with regard to hydrogen R&D. Today, the bulk of the research effort resides with companies like BMW and Daimler and with regional governments, particularly Bavaria. The national government continues to support some development efforts, but at a vastly reduced level (approximately \$1 million).

Switzerland's Hydrogen Energy and Technology Program supports hydrogen as an important secondary energy carrier and chemical commodity that is funded at approximately \$3.8 million. Private funding is around \$300,000 United States Dollars (USD) per year.

Norway's funding is on the order of \$600,000 annually. The bulk of Norway's hydrogen development efforts comes from industry. Currently, approximately \$2.5 million is being spent on hydrogen demonstration projects and this number is increasing. Electrolysis and fuel cells receive the bulk of the government support.

The Netherlands funds an estimated \$2 million per year toward hydrogen-specific technologies. Sweden is funding more than \$5 million in hydrogen or hydrogen-related research, including fuel cells. The Swedish portfolio includes renewable production, including direct water splitting (both electrolysis and biological), solid-state storage materials and utilization.

Question: H.R. 2174, the Robert S. Walker and George E. Brown, Jr. Hydrogen Energy Act of 2001, was drafted with such integration in mind. Would you please discuss, and provide written recommendations, as to how the bill may facilitate the recommended integration of hydrogen programs?

Answer: The programs within the Office Energy Efficiency and Renewable Energy (EERE) are coordinating their activities to achieve the performance goals outlined in The President's National Energy Policy (NEP). This coordination role was established per Section 106 of the Matsunaga Hydrogen Research, Development and Demonstration Act of 1990, (P. L. 101- 566), and amended in Section 105 of the Hydrogen Future Act of 1996, (P. L. 104-271). The Department implemented this coordination process at the time it assigned responsibility for its Hydrogen Program to EERE in June 1991. Through the Deputy Assistant Secretary, each EERE sector office's cross-cutting technology programs are directed to meet regularly to discuss accomplishments, plan collaborative projects and meetings, and present their programs to the Hydrogen Technical Advisory Panel.

Crosscutting technology programs within other agencies are more difficult to coordinate. The Department has recently completed an investigation of all Federally funded hydrogen projects using the Rand database. Total funding for all hydrogen and hydrogen related research is approximately \$120 million per year. The agencies funding projects include the Department of Agriculture, Commerce, Defense, Energy and Transportation; however, most of this research is mission oriented and not specific to the application of hydrogen as an energy system.

The Department's recommendation to improve this coordination role would be to assign the Assistant Secretary for EERE the responsibility and authority to request information on each agency's hydrogen and hydrogen related research and development. The Assistant Secretary for EERE, in consultation with members of his staff, would meet with other agency heads and Administration personnel to draft a comprehensive coordination plan that could be presented to Congress.

Question: Later in your testimony you state, "The Administration believes a coordinated interagency effort will strengthen our ability to move toward commercial use of hydrogen.." Is this the same or a different approach from the program integration mentioned earlier in your testimony? How would such an interagency approach be structured? Does an appropriate model currently exist? Is legislation required? Section 7 of H.R. 2174, the Robert S. Walker and George E. Brown Jr. Hydrogen Energy Act of 2001 provides that the Secretary of Energy shall "...develop, with other Federal agencies as appropriate and industry, an information exchange program to improve technology transfer for hydrogen production, storage, transportation, and use, which may consist of workshops, publications, conferences, and database for the use by public and private sectors..." Is this a sufficient interagency effort? If not, please provide comments on how to strengthen this language.

Answer: The DOE would recommend an approach that involves all Cabinet level members of this Administration, who would meet and discuss options for the best method(s) to integrate and report on all interagency activities related to hydrogen research. After these meetings, the Department of Energy would prepare a comprehensive plan to Congress on its recommendations.

The Department has several examples of interagency agreements dealing with technologies. However, none are as extensive as that which would be required to integrate efforts on all fuel cells and hydrogen technologies.

The programs within EERE support a number of outreach activities to transfer technology information to the private sector, per Section 105 of the Hydrogen Future Act of 1996. These include competitive support for domestic and international conferences; peer review meetings using industry members as technical reviewers; websites for specific technologies; publishing of technical papers in peer reviewed journals; and the production of brochures, compact discs, and videos that illustrate recent accomplishments.

Other agencies use their own internal policies for dissemination of information. We would propose that this topic be discussed at the interagency meeting identified above, and be included in the comprehensive coordination plan to be presented to Congress.

Question: As you are aware this Committee's past authorizations for hydrogen R&D have greatly exceeded the actual appropriations (appropriations have been approximately 50 percent of authorization). H.R. 2174, the Robert S. Walker and George E. Grown, Jr. Hydrogen Energy Act of 2001, significantly increases authorization for appropriation in each fiscal year 2002 through 2006. If the appropriators meet these authorized levels, will the U.S. Department of Energy (DOE) and industry programs be able to respond in a productive, meaningful and coherent way?

Answer: Hydrogen can be produced in many ways and from diverse domestic resources. As such, hydrogen is an ample clean energy choice that also offers a secure energy option for the nation. The Hydrogen Program has been supporting industry activities in the low-cost production of hydrogen, low-weight hydrogen storage systems and end-use systems, including the development of codes and standards. In recognition of hydrogen's potential, there has also been significant industry investment in fuel cells for stationary power generation, and by the automobile and oil companies in hydrogen fuel cell vehicles and hydrogen infrastructure.

There are still significant remaining issues that are associated with the cost and durability of fuel cells, the establishment of the hydrogen infrastructure, advanced hydrogen storage systems, and the acceptance of the codes and standards for hydrogen systems. The industry is proceeding with test programs for stationary fuel cells and fuel-cell vehicles and buses. There is a need for increased Federal funding to conduct research and development necessary to achieve the cost and performance goals for the production, storage and utilization of hydrogen, and the integration of fuel cell systems into Federal and State facilities. Thus, Federal and State governments will be early users of hydrogen systems to support the significant industry investments being made.

The President's National Energy Policy (NEP) is a coherent plan that specifically recognizes the importance of hydrogen to the future of the nation. The FY 2003 budget submission for the Hydrogen Program is being formulated to meet the objectives of the NEP and to address the industry's increasing needs.

Solar

Question: Why is DOE ending its support for the Concentrating Solar Power program?

Answer: Due to the reduced size of the budget for DOE, and competing priorities, we decided to reduce funding for this program. Since its inception in 1975, the Concentrating Solar Power program (formerly called the Solar Thermal program) has received approximately \$1.0 Billion and much of the technology developed under this program is commercially available and in use around the world. This makes federal funding much less critical now than in the past. In addition, the National Research Council issued a report critical of further federal funding. The budget does contain almost \$2 million for close-out costs.

(Dollars in thousands)

	FY2001	FY2002	\$Change	%Change
Concentrating Solar Power	\$13,710	\$1,932	-\$11,778	-86%

Definition: "Concentrating Solar Power" – This program has funded demonstrations using systems of mirrors to focus solar ray on materials that were heated to transfer this heat to water or some other fluid to run turbines, etc.

Question: Can solar energy provide all the energy needed by a home?

Answer: It can be done. In niche domestic markets it is being done today. In global markets with low electricity needs, no central power and significantly higher energy costs it can be cost effective. A net-zero energy home, which combines energy efficiency and renewable power is one scenario our R & D is pursuing. The challenge is optimizing solar and energy efficiency technology so it becomes a viable standard that can be incorporated into home building as local conditions and prices dictate.

Question: What other parts of the Department of Energy are participating in this initiative and what funding is included in each of those budgets for the initiative in fiscal year 2001?

Answer: The following table reflects all DOE funding in the fiscal year 2001 Congressional Request for the Scientific retention and recruitment initiative.

Other DOE Funding in FY2001 for the Scientific Retention and Recruitment Initiative (dollars in thousands)	
Fossil Energy.....	600
Energy Supply	
Solar and Renewable.....	30
Nuclear.....	150
Total Energy Supply.....	180
Science.....	2,000
Weapons Activities.....	3,600
Defense Environmental Management.....	1,000
Other Defense Activities	
Nonproliferation & National Security.....	1,000
Fissile Materials Disposition.....	100
Total Other Defense Activities.....	1,100
Nuclear Waste Disposal Fund.....	100
Total Department of Energy.....	\$ 10,650
FY99 Appropriations \$3.60	
FY2000 Request \$5.50 million million Solar Buildings	

Question: The original budget request for FY2002 would have reduced DOE research for all renewable sources, except for biomass and biofuels, by approximately 50 percent. The Administration has recently submitted a budget amendment that would restore funding for some of the renewables to FY2001. However, this amendment does not propose to restore funding for solar and photovoltaic technologies. Explain the technical and policy basis for reducing the DOE investment in this particular technology.

Answer: The Nation needs a balance of clean and reliable near-term and long-term energy options. Solar continues to be a technically viable option. The funding request for solar programs, including photovoltaics, is significant at about \$43 million, and is still more than most other programs in the renewable portfolio.

Wind

Question: The United States is the most advanced country in the world and the leader in many areas of technology, but renewables is not one of them. New wind turbines that are currently being installed in the Pacific Northwest are designed and built in Denmark. Europe and Japan are the leaders in renewable energy technologies and what can this Administration do to help U.S. manufacturers regain leadership in this field.

Answer: The picture is not as bleak as suggested, and varies by renewable technology. For example, the United States is currently second in the world in terms of installed wind powered generation capacity. Based on announced industry development plans and construction starts, we project at least 1,500 MW of newly installed wind capacity additions in 2001 in the United States. One U.S. wind turbine manufacturer is supplying over 25% of this new capacity, and is among the top five wind turbine manufacturers in the world. In the case of photovoltaics, the U.S. is the world technology leader despite intense international competition. This is evidenced by the establishment of several U.S. world record solar cell efficiencies that have been achieved during the last five years.

Achieving greater renewable energy technology leadership in the United States requires sustained investment in research and development, as well as policies that help stabilize domestic markets for renewable energy. The President's National Energy Policy (NEP) report includes thirteen recommendations to increase use of renewable and alternative energy, including several that directly address both of these needs. The report specifically recommends supporting next generation technology research and development for alternative forms of energy. Through a continued focus on both fundamental and applied

R&D, in collaboration with industry, we will help the United States achieve greater leadership in the development of advanced renewable energy technologies which, in turn, will lead to increased sales.

As pointed out in the NEP, an example of the opportunity for securing technology leadership in renewable energy is the pursuit of wind systems for cost-effectively harnessing lower wind speed resources, which are much more broadly available than wind resources being developed today. Because of less intense cost competitiveness of their domestic markets, foreign wind technology concerns are not emphasizing low wind speed R&D. The Department of Energy is already focusing on R&D that will provide the technical foundation for the U.S. wind industry to become the world leader in low wind speed technology. This advanced technology, which will expand the cost-competitive domestic wind resource base twenty fold, is essential for continued long term growth and significant contributions of wind power (more than 40,000MW by 2020) to the U.S. electric supply portfolio.

The National Energy Policy also endorses extension and expansion of tax credits that are critical investments for allowing a U.S. renewable energy industry to develop. For example, consistent financial incentives have been available for wind power development in Europe for a sufficient period of time to attract and support numerous wind turbine manufacturers. The on-again/off-again availability of a Production Tax Credit in the United States has been a significant impediment to establishing a robust U.S. wind industry. In response to the NEP, the Departments of Energy and Interior are also evaluating access limitations to Federal lands in order to increase renewable energy production and help to expand and stabilize domestic energy markets.

Question: Many farm-belt states are net energy importers, costing billions of dollars to these already strapped rural economies, and high energy prices are making the situation even worse. Despite the fact that several studies have documented tremendous potential for renewable energy in these states: South Dakota, for instance, is ranked as one of the highest states for wind energy potential, the region has had trouble capitalizing on these resources. Do you support federal initiatives that would lead to significant growth in the industry, especially in these states where the potential is so great?

Answer: I believe there is an appropriate role for the Department to cooperatively help the farm belt states respond to their energy issues. There is an excellent opportunity for renewable energy technologies such as wind and biomass to become an important new industry that can strengthen local and state economies throughout rural America. While each state will ultimately have the responsibility to assure that their individual policy, legislative, and regulatory framework supports renewable energy, the Federal government can and should help introduce new opportunities to the states by providing central leadership and coordination in overcoming the common barriers faced by renewable technologies. This past year, DOE co-sponsored wind and biomass energy workshops in several states throughout the Midwest and Upper Great Plains, including South Dakota, North Dakota, Nebraska, Montana, Kansas. In each instance the response was overwhelming, the information and assistance we provided was well received, and the workshop has led to a focused state effort to seriously explore wind and biomass development.

As one example of how renewable energy can help rural America, wind energy is compatible with farming, ranching and many other outdoor uses. Farmers plow right up against service roads, cattle graze up to turbine pads, and land owners love the additional revenue. In Iowa, participating farms typically have 2 to 6 turbines on them. Land owners receive about 2 percent of the gross revenue from annual power sales, or about \$2,000 per turbine. At a time when the farm economy is in tough straits, wind power appears to be an ideal crop.

Likewise, the great potential of American farm belt -- the world leader in the production of food and animal feed B could also simultaneously be harnessed for production of biomass energy feedstocks. It is my understanding that the Department of Energy has made substantial progress toward this end by collaboratively working with farmers, power generating companies, and ethanol producers to examine and test concepts for using both dedicated energy crops and food crop residues to produce electricity and ethanol for transportation fuel. Supportive policies such as state tax measures supporting land use for energy crops (New York) and a special exemption by the USDA's Conservation Reserve Program (CRP) that allows farmers to periodically harvest energy crops from CRP lands (Iowa). Federal tax incentives such as the Section 45 tax credit for biomass power production have also generated interest.

While we are just commencing the development of a new, comprehensive national energy plan for the United States, I believe that the research and development of renewable energy technologies -- such as cofiring biomass with coal for power production and finding lower cost methods of ethanol production for cleaner transportation fuels -- will comprise an important part of our country's future energy mix. Development of such technologies also hold the promise of further encouraging the most efficient and productive use of our Nation's world-leading agricultural capability while enhancing state (and national) energy independence, strengthening farm economies, and improving soil, water and air quality.

Question: Wind power is the fastest growing source of energy in the world, with over 17,500 megaWatts of installed capacity. U.S. capacity is just over 2,500 megaWatts, which provides nearly 6 billion kiloWatt-hours of electricity annually or enough to power 600,000 homes. Those domestic totals are expected to nearly double in 2001. Furthermore, the cost of wind is currently 3-5 cents per kiloWatt-hour, comparable to new coal and natural gas facilities. Under your leadership will the Department of Energy continue to support initiatives to increase the percentage of electricity derived from wind?

Answer: President Bush has reaffirmed his commitment to increased production from conventional and alternative domestic energy sources. Until we've completed development of a national energy policy, I cannot comment in detail. However, as one of the most rapidly growing sources of energy in the world as well as one of the quickest to install, I would expect that wind energy would play an increasingly important role in domestic power production.

Question: Another renewable energy program showing great promise these days is the wind program. In cooperation with your National Renewable Energy Laboratory, we now have the first utility-grade wind project in Alaska at Kotzebue above the Arctic Circle. The first three wind turbines are operating, and to date successfully, I might add, nine more units are on order. In addition a cold weather technology center is planned. May I assume your Department's continued support for this project and the promise it holds for rural, northern latitudes communities around the world.

Answer: The Department and the National Renewable Energy Laboratory will continue their support of the Kotzebue wind project. This project has the potential to serve as a model for the installation of wind energy systems in other rural communities in Alaska and elsewhere that are at present totally dependent on diesel generators for the production of electricity. The Kotzebue Electric Association, the utility that serves the community of Kotzebue, believes that the experience it gains in the operation of its wind energy system may enable it to become a focal point for information on cold weather technology. Ultimately, this expertise may enable Kotzebue Electric to market its services to help establish wind energy systems in other northern latitude communities in Alaska and in foreign countries.

Question: This year you took a major step back on your support for wind energy - what's the explanation for this dramatic turnaround? We're already losing the international battle for the wind market and your budget sends a signal that we're no longer concerned about our international competition. How will reduced federal funding impact our U.S. wind industry?

Answer: We believe that the wind program should be modified while protecting our core competencies pending recommendations from Vice President Cheney's Energy Task Force. We are committed to ensuring that the U.S. wind industry continues to strengthen our domestic energy supply and the competitive position of U.S. industry.

(dollars in thousands)

	FY2001	FY2002	\$Change	%Change
Wind Energy Systems	\$39,553	\$20,500	-\$19,053	-48%

Question: If the cost of energy from wind has improved dramatically as you say in your budget request, why do you still need an R&D program?

Answer: While wind technology has improved significantly in the last 20 years, evolution of the competitive marketplace continues to pose some pricing challenges to the commercialization of wind power. Natural gas technology for example, has also improved its combustion technologies in ways not foreseen 20 years ago -- today one cubic foot of gas can do the job that took two cubic feet 20 years ago. In order to compete more broadly with the other energy sources, the cost of wind power must be reduced for the next generation of wind turbines that can use the wind resources available across much larger expanses of the country. As the electricity marketplace changes from regulated to more competitive markets lower initial cost options such as natural gas (at historic prices) are attractive to risk averse investors. Thus to take advantage of the

opportunity wind energy presents to expand the domestic energy base R & D is still needed to reduce capital costs and expand its use.

(dollars in thousands)

	FY2001	FY2002	\$Change	%Change
Wind Energy Systems	\$39,553	\$20,500	-\$19,053	-48%

Question: How can you be so sure that additional wind R&D has a payoff to the United States?

Answer: Wind technology costs of energy have declined from 10 cents per kWh 10 years ago, to 4 to 6 cents today in good wind regions and are expected to drop further in the next few years. The major hurdle is the need for competitive technology from several vendors for the more available low wind speed sites. The next generation of wind technology needing collaborative R&D is the 'low'-wind speed machines.

Wind technology can be improved by systems engineering and improved components. With assistance from the National Renewable Energy Laboratory (NREL) and Sandia National Laboratory (SNL), Enron Wind has reduced the cost of their Z-750 series turbine by over \$100,000 per turbine. Without subsidy, the Enron 1.5 MW is expected to deliver energy at 3.3 cents per kWh. Enron's their Next Generation Turbine under development with NREL is projected to be below 3 cents in a high wind resource class region.

(dollars in thousands)

	FY2001	FY2002	\$Change	%Change
Wind Energy Systems	\$39,553	\$20,500	-\$19,053	-48%

Other

Question: What are the potential benefits for the power sector of R&D investments in advanced flywheels, super-capacitors, superconducting magnetic energy storage (SMES), compressed air energy storage (CAES), and advanced battery technologies?

Answer: Each of these technologies is a distinct approach to reap the benefits of better energy storage systems. Energy storage can improve the efficiency and reliability of the electric utility system by reducing the requirements for spinning reserves to meet peak power demands, making better use of efficient baseload generation, and allowing greater use of intermittent renewable energy technologies. Efficient, reliable storage devices allow certain forms of distributed generation to succeed in broader applications by utilizing stored energy during periods of peak demand. These advanced technologies are in various states of development and carry a high level of investment risk that necessitates federal involvement in their development.

(dollars in thousands)

	FY2001	FY2002	\$Change	%Change
Electric Energy Systems Storage	\$5,987	\$5,987	\$0	0%

Question: What is the status of state efforts to implement electricity restructuring?

Answer: As of April 2001, 24 states have enacted electricity restructuring legislation and 18 other states have ongoing investigations, either by the public utility commission or by the State legislatures.

Question: What is superconductivity and why is it important?

Answer: Superconductivity is the ability of certain materials to conduct electrical current with no resistance and extremely low losses. The technology can be applied to electric power devices such as motors and generators, and to electricity transmission in power lines. The superconducting equipment now being developed promises to meet the needs of a higher capacity, more efficient, more reliable electricity system.

A superconducting power system could meet the growing demand for electricity with fewer power plants and transmission lines than would otherwise be needed. For example, transmission line losses that account for a large amount of wasted energy in today's infrastructure can be drastically reduced through the development of superconducting equipment, changing electricity from a regional to a national commodity.

Superconductivity will also assist in providing large amounts of electricity to high-density urban areas by carrying more power through each wire. Superconductivity is a priority of the Department of Energy and an important part of providing a new, successful electricity infrastructure that should reach marketability within the next 10 years.

Question: There was an increase in the FY01 appropriation to accelerate development on the "second generation" of HTS (high temperature superconductivity) wires. What has resulted?

Answer: A total of \$6 million from the FY01 appropriation (the appropriated amount increased \$5M over FY 00) accelerated development in two important ways:

1. Additional effort was initiated in three competitively awarded contracts for industrial scale-up of breakthroughs at Los Alamos and Oak Ridge, and,

2. New laboratory equipment was purchased and new staff added at Los Alamos and Oak Ridge National Laboratories for increased collaborative research with private companies. A laboratory at the new Los Alamos Research Park will be dedicated this summer for laboratory/industry joint work, and laboratories at Oak Ridge were consolidated in April to bring together researchers that were previously scattered.

Joint research at the national laboratories is essential for industrial development of these exciting technologies and the new equipment gives the laboratories the facilities needed to do this. Successful collaboration helps to ensure continued U.S. leadership in this area.

(dollars in thousands)

	FY2001(000's)	FY2002 (000's)	\$Change	%Change
HighTemperature	\$36,819	\$19,000		
Superconductivity R&D		\$17,819 amendment		
		\$36,819	\$0	0%

Question: What is the Transmission Reliability program doing to support the western energy situation?

Answer: The program is developing real time monitoring tools to support the Independent System Operators managing parts of the national grid. The program is also evaluating regulations to determine ways to promote competitive markets, to deter market gaming (monopoly by one utility), and to eliminate market barriers by developing national standards for interconnectivity.

Question: Explain the purpose, process, and funding for the Department's initiative to create a National Alliance of Clean Energy Incubators. Explain the competitive process used to select the particular non-federal partners in this initiative.

Answer: The National Alliance of Clean Energy Incubators is a National Renewable Energy Laboratory (NREL) effort to assist small energy companies entry into the market arena. While many small clean energy companies are capable technology developers, they lack the business acumen to successfully enter the market place. Incubators accelerate the growth and success of companies by providing mentoring, business services and expertise, and access to capital.

Working through State Energy Offices, NREL spent a year to identify and align with experienced, existing incubators, who had an excellent network of resources and business expertise. NREL targeted states with a good support base for incubators and clean energy. It was equally important to find incubators with a strong desire to work in the clean energy area. There are currently eight partners in this seven state effort. No NREL funding goes to any of the incubators.

Question: What is the impact of the FY2002 budget request for the Office of National Renewable Energy Laboratory?

Answer: Although the funding dedicated to NREL is proposed to increase slightly over FY 2001, the overall budget for Renewable Energy Resources is proposed to decline by 36 percent, from \$373 million in FY 2001 to only \$237 million in FY 2002.

The National Renewable Energy Laboratory (NREL) is the Department of Energy's premier laboratory for renewable energy technology development. NREL houses the National Center for Photovoltaics as well as the National Wind Technology Center. The proposed funding reductions for Renewable Energy Resources may have a negative impact on staffing at NREL, particularly in the technology areas of Solar and Wind technologies. The exact magnitude of this potential impact on R&D is being determined.

NREL is also a focal point for research and development areas that are being emphasized in the FY 2002 budget request. NREL's role in the development of Biomass technologies is of high importance as its role in Distributed Energy Resources and Hydrogen R&D. The Department is also looking at taking actions that could help mitigate the magnitude of the potential negative impact. In a reduced budget scenario the Solar and Wind programs will be studied to see if any consolidation of activities at NREL is feasible rather than implementing the program across Departmental locations. The amount of subcontracting by NREL and other laboratories will also be reviewed to determine additional in-house research and development activity that could be undertaken at NREL. These Departmental actions coupled with NREL's growing role in technology development could mitigate some of the negative potential for staffing reductions at NREL.

Question: What is your office doing to address this country's aging electricity distribution infrastructure?

Answer: The transmission and distribution systems in the United States are regulated by the Federal and State governments, respectively. The U.S. transmission system was not designed to support the sale of energy and ancillary services that are becoming available through competitive markets, which is causing heavy power flows and stress on the grid. This subsequently causes congestion points on the grid that, to date, are relieved by redispatching generation, and overriding energy purchase decisions under competitive markets. The Department has initiated a National Transmission Grid Study to examine the benefits of a grid that supports full competition, and identifies bottlenecks and measures to remove them. The

study, to be published by December 31, 2001, will contain recommended actions for the Department and electricity industry stakeholders to move toward a grid for competition. Current programs within the Department's Office of Power Technologies are aimed at upgrading the capacity of existing transmission corridors without building new lines. These are listed in the following table:

Technology	OPT Program
Real Time Monitoring and Control Systems	Transmission Reliability
Advanced Composite Overhead Conductors	
Demand Responsive Load Control	
Superconducting Technology	
Transmission and Distribution Cables	High Temperature Superconducting
Transformers	
Flywheel Storage Systems	
System Integration	Energy Storage Systems
Subsystem Development	
Strategic Research and Analysis	
Strategic Location of New Generation Units	Distributed Energy Resources

These programs will allow the industry to upgrade the transmission system by integrating alternative generation, energy storage, and demand control options, along with new transmission technologies into a energy services delivery infrastructure that facilitates full competition and provides service choices down to the individual customer.

Distribution systems are under State regulation where public service commissions can provide rate relief and regulatory pressure to ensure adequate maintenance and operation. The Department is drafting a report that responds to a recommendation in the Power Outage Study Team report to support reporting and sharing of utility "best practices" for maintaining and operating distribution systems.

The Department intends to work with the electric power industry to facilitate the collection and sharing of information on "best practices", and promote the use of uniform definitions and measurements for reliability-related events. Other report recommendations DOE is implementing are the removal of barriers to the use of distributed generation and storage, development of ways to allow customer participation in competitive electricity markets, and public interest reliability-related research and development consistent with the needs of a restructuring electricity industry.

Question: What does reliability measure?

Answer: Reliability is a term that measures the length of electricity outage periods. 'Three nines reliability' or 99.9% reliability, is equivalent to about 25 hours of outages per year. 'Six nines reliability' refers to approximately 31 seconds of outages per year. Some customers however may have longer down times due to equipment jams and cleanup.

(dollars in thousands)

	FY2001	FY2002	\$Change	%Change
Transmission Reliability	\$8,940	\$8,940	\$0	0%

Question: The FY01 Senate Report under "Electric Energy Systems and Storage" urged the DOE to "begin a research program to develop solutions for grid reliability issues through the use of advanced computer simulation capabilities available within the national laboratories. What has the Department done to respond to this language?

Answer: The Pacific Northwest National Laboratory (PNNL) is leading a project to use real time data to validate existing models in the Western electric power system, and establish specifications and standards for data sharing and communications for real time control systems. PNNL and the Oak Ridge National Laboratory are investigating the integration of on-line and off-line security analysis software tools to manage security assessment and congestion management in a grid that is becoming increasingly complex. The Department also supported discussions with Los Alamos National Laboratory concerning their capabilities in computer simulation and power system analysis for possible participation in the program.